

## WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

After more than two months of low and fluctuating barometric pressure over the tropical Atlantic and Gulf of Mexico, and attendant stagnated and unusually warm and dry weather over the interior of the United States, September opened with a resumption of average atmospheric pressure in the South and a more active movement of barometric areas over the North American Continent. The continental changes were indicated by the following special forecast that was issued August 29:

The week beginning Monday, August 30, will be one of moderate temperature generally in districts east of the Rocky Mountains. Rain will set in over the great corn growing States about the middle of the week and the rain area will move eastward to the Atlantic States by the close of the week. The rains will be followed by a period of cool weather for the season in middle and northern sections of the country.

During the period covered by the forecast there was a rapid succession of areas of high and low barometric pressure over middle and northern portions of the United States with alternating periods of cool, frosty weather, and rains from the Plateau region over the northern tier of States to the Atlantic. An area of low barometer that appeared over the Plateau region September 1 advanced over the Plains States on the 2d, the Mississippi Valley and the western Lake region on the 3d, and reached the Atlantic States Saturday the 4th, attended by moderate to heavy rains and followed by frost-producing temperatures in the more northern States from the upper Missouri Valley to New England. In Wisconsin many thousands of dollars damage was caused to the cranberry crop. Timely warnings were issued by the Weather Bureau, but the usual protection by flooding could not be employed owing to an insufficient supply of water in the reservoirs.

From the 5th to 7th heavy rains that fell on the southwest margin of an extensive area of high barometer caused considerable damage by flood in Colorado. Following the movement of the high area eastward over the Lake region and New England an area of low barometer advanced from the Plains States over the Mississippi and Ohio valleys to the middle Atlantic coast from the 8th to 10th, attended by general rains that supplemented the rains of the preceding week and practically ended a drought that had been particularly severe in the Middle Atlantic States. The rains were not sufficiently heavy, however, to replenish the water supply in streams. From the 8th to 10th a barometric depression advanced from the Alaska coast south-eastward over the British Northwest Territory and drifted thence slowly eastward over the Rocky Mountains and Plains States to the Mississippi Valley by the 14th, and reached the Atlantic coast on the 16th, attended by showers and followed by cooler weather.

## THE TROPICAL STORM OF SEPTEMBER 12-21.

During the first decade of the month pressure continued abnormally high over the Azores region and, except on the 6th and 7th, was high over and near the British Isles. This distribution of pressure, by increasing the strength of the northeast trade winds, promoted in the tropical regions of the southwestern Atlantic conditions favorable to the development of cyclonic disturbances. The barometer began to fall over the Lesser Antilles September 10, and from the 12th to 14th a depression of apparent slight intensity moved westward over the Caribbean Sea. On the morning of the latter date two centers of cyclonic action appeared, one north and the other south of the Island of Jamaica. By the following morning the northern depression had apparently dissipated and the one to the southward of Jamaica had increased in intensity and was moving northwestward toward the Yucatan Channel where it arrived the morning of the 17th. At that time the barometer at Pinar del Rio, Cuba, read 29.44 inches, the wind had attained a

velocity of 60 miles an hour from the northeast and a twenty-four-hour rainfall of 7.88 inches was reported. Reports indicate that the storm damage in Pinar del Rio Province aggregated about \$1,000,000. From a position off the western extremity of Cuba the storm center moved northwestward over the Gulf of Mexico and reached a point near the mouth of the Mississippi River on the morning of the 20th.

Advices issued from the 12th to 14th were based upon observations taken at considerable distances from the center of the disturbance and were necessarily limited to statements regarding its apparent location and probable course. Advices of the 15th stated that the disturbance was west of Jamaica and that it would probably move northwestward to the Yucatan Channel. On the following day, the 16th, Atlantic and Gulf shipping interests and ports were notified that the hurricane center was apparently moving slowly toward the west Cuban coast or the Yucatan Channel, and on the 17th the following was telegraphed:

Hurricane center has reached Pinar del Rio Province, Cuba, and apparently moving northward. Shipping in south Atlantic and east Gulf ports or due to sail for southeast coast waters advised to remain in port.

By the 18th the course of the storm was more clearly indicated and advices stated that the center of the hurricane was apparently advancing toward the central Gulf of Mexico. On this date storm warnings were ordered for the western Florida, Alabama, Mississippi, and eastern Louisiana coasts. On the 19th the storm warnings were extended to the northern Texas coast; middle Gulf ports were advised that the center of the tropical hurricane was apparently approaching the Louisiana coast and hurricane warnings were ordered for the Louisiana coast. Advices of the morning of the 20th stated that the hurricane center was near the mouth of the Mississippi River and would move northward over Louisiana.

At the regular 8 a. m., seventy-fifth meridian time, observation of the 20th the report from Burrwood, La., a Weather Bureau station at the mouth of the Mississippi, was missing and New Orleans, about 70 miles to the northwestward of the storm's vortex, was the nearest point from which a report was received. At that place the barometer was 29.68 inches, wind northeast and blowing at a rate of 36 miles an hour and a rainfall during the preceding twelve hours of 0.94 inch. It was calculated at that time that barometric pressure at the center of the storm was about 29 inches. The barometer fell steadily at New Orleans and at 8 p. m. read 29.22 inches, with wind from the southeast and blowing 48 miles an hour, with an extreme recorded velocity of 68 miles and a rainfall of 2.86 inches during the preceding twelve hours. The center of the storm was then west and probably within 50 miles of New Orleans.

At 3 a. m. of the 21st barometric pressure at Vicksburg, Miss., was 29.06 inches. By 8 a. m. of the 21st the center had advanced to a position over southeastern Arkansas, with lowest reported barometer 29.34 inches at Little Rock where the wind was from the north and an extreme velocity of 40 miles an hour had been recorded. Moving thence northward the center of disturbance reached west-central Illinois by 8 p. m., with pressure 29.40 inches at Springfield, Ill. By that time the storm had merged with a barometric depression that had moved eastward over the Plains States, and by the morning of the 22d a trough of low barometer extended from Lake Superior to the Rio Grande Valley, with lowest pressure 29.50 inches at Sault Sainte Marie, Mich. During the succeeding forty-eight hours the barometric trough moved eastward to the Atlantic coast attended by general rains that were heavy in localities and followed by an extensive area of high barometer and cool weather that carried the frost line to the northern portions of the middle Gulf States.

A full report on the effects of the above mentioned hurricane in the vicinity of New Orleans has been prepared by I. M. Cline, Official in Charge of the Weather Bureau office at that place, and appears in the summary of District No. 7, page 623.

At Mobile many vessels ran up the river about 12 miles for shelter and a number of those that remained at Mobile were sunk or damaged. The loss to shipping was estimated at \$3,000. The damage to property in Mobile, mostly by high water, was estimated at \$5,000. The estimated value of merchandise and goods that were saved by removal from wharfs and lower floors in stores was \$400,000. At small towns on the Alabama coast the damage by wind and high tides was estimated at \$6,000. At Coden the water in the town was about 3 feet deep. At points on the Mississippi coast the tides reached heights of 8 to 12 feet. The loss at Scranton was about \$11,000 and at Biloxi about \$43,000. At Gulfport and vicinity the damage by wind was about \$7,000 and by tides about \$150,000. The damage by wind at Pass Christian, Bay St. Louis and vicinity was about \$20,000, and by high tides, including railroad losses, about \$800,000. At these points the storm was considered the severest ever experienced. About 200 bath houses and 20 modern residences on the beach were demolished and many others damaged. Four large and six small fishing schooners were wrecked and numerous small boats were beached. Only three lives were lost on the Alabama and Mississippi coasts. The warnings that were sent along these coasts are said to have been instrumental in saving lives and much property.

The damage in Pensacola Bay, that was confined largely to small craft, wharfs, bath houses, etc., was estimated at \$4,000. Warned of the approaching storm, many families left their homes along the bay shore and found safer quarters. Parties in the bathing pavilions on Santa Rosa Island were brought to the city. Steamers in the harbor kept up steam and small vessels and some of the fishing fleet anchored across the bay.

Following the passage over the continent of the tropical disturbance barometric pressure continued low over the Greater Antilles and the Florida Peninsula during the balance of the month. From the 21st to 24th an extensive area of high barometer moved from the north Pacific coast over the Lake region and central valleys, where it remained nearly stationary until the 27th, with heavy frost in the upper Lake region and upper Mississippi Valley the morning of the 27th, after which it settled southward over the Gulf States, with light frost in Tennessee the morning of the 29th.

A notable feature of the third decade of September was the prevalence over the Azores of exceptionally low barometric pressure. At Horta, Fayal, the barometer began to fall rapidly on the 25th, reached 29.40 inches on the 27th and rose very slowly to 29.50 inches by the morning of the 30th, with maximum reported wind velocity 52 miles an hour from the southwest on the 30th. The pressures thus noted were in the southern quadrants of a low barometer area that was central over the mid-Atlantic north of the Azores. The center of this low area evidently moved northward toward Iceland where a pressure of 28.78 inches was reported October 2.

#### Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	5.9	+ 0.7	Missouri Valley.....	4.2	+ 0.2
Middle Atlantic.....	5.2	+ 0.6	Northern slope.....	4.7	+ 0.7
South Atlantic.....	5.3	+ 0.6	Middle slope.....	3.2	+ 0.3
Florida Peninsula.....	5.2	- 0.2	Southern slope.....	2.8	- 1.0
East Gulf.....	4.6	0.0	Southern Plateau.....	2.2	+ 0.3
West Gulf.....	2.8	- 1.4	Middle Plateau.....	3.3	+ 0.4
Ohio Valley and Tennessee.....	4.5	+ 0.1	Northern Plateau.....	4.9	+ 1.3
Lower Lakes.....	5.2	+ 0.4	North Pacific.....	4.9	+ 0.2
Upper Lakes.....	5.4	+ 0.2	Middle Pacific.....	3.6	+ 0.2
North Dakota.....	4.0	+ 0.2	South Pacific.....	2.9	+ 0.3
Upper Mississippi Valley.....	4.5	+ 0.2			

#### Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England.....	12	60.4	- 0.2	+ 2.6	+ 0.3
Middle Atlantic.....	16	65.4	- 1.2	+ 7.5	+ 0.8
South Atlantic.....	10	71.9	- 1.2	+ 9.9	+ 1.1
Florida Peninsula*.....	8	79.2	0.0	+ 15.9	+ 1.8
East Gulf.....	11	75.9	+ 1.1	+ 10.4	+ 1.2
West Gulf.....	10	77.3	+ 1.9	+ 15.4	+ 1.7
Ohio Valley and Tennessee.....	13	67.4	- 0.9	+ 5.8	+ 0.6
Lower Lakes.....	10	61.2	- 1.7	+ 0.2	0.0
Upper Lakes.....	12	53.0	- 0.9	+ 6.1	+ 0.7
North Dakota*.....	8	58.8	+ 2.1	+ 1.0	+ 0.1
Upper Mississippi Valley.....	14	63.8	- 1.0	+ 3.2	+ 0.4
Missouri Valley.....	12	66.0	+ 0.7	+ 7.8	+ 0.9
Northern slope.....	9	58.5	+ 1.0	+ 1.4	+ 0.2
Middle slope.....	6	68.2	+ 0.6	+ 7.2	+ 0.8
Southern slope*.....	8	73.4	+ 0.5	+ 12.6	+ 1.4
Southern Plateau*.....	10	68.3	+ 0.2	+ 4.9	- 0.5
Middle Plateau*.....	11	59.6	- 0.6	+ 3.3	+ 0.4
Northern Plateau*.....	11	60.0	+ 1.2	- 2.6	- 0.3
North Pacific.....	7	57.9	+ 1.0	- 9.3	- 1.0
Middle Pacific.....	5	64.9	+ 0.5	- 1.9	- 0.2
South Pacific.....	4	68.4	+ 1.1	- 0.2	0.0

#### Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
New England.....	11	Inches. 4.20	131	Inches. + 1.0	Inches. + 0.1
Middle Atlantic.....	16	2.58	76	- 0.8	+ 0.1
South Atlantic.....	11	2.79	57	- 1.9	- 5.8
Florida Peninsula*.....	8	4.54	57	- 3.4	- 1.4
East Gulf.....	11	3.73	76	- 0.2	+ 6.8
West Gulf.....	10	1.44	42	- 2.0	- 11.1
Ohio Valley and Tennessee.....	13	2.81	104	+ 0.1	+ 3.1
Lower Lakes.....	10	2.34	82	- 0.5	+ 2.2
Upper Lakes.....	12	2.36	72	- 0.9	0.0
North Dakota*.....	8	1.04	68	- 0.5	+ 0.2
Upper Mississippi Valley.....	15	3.44	100	- 0.0	+ 0.6
Missouri Valley.....	12	3.76	73	+ 1.0	+ 2.1
Northern slope.....	9	1.38	82	- 0.3	+ 0.5
Middle slope.....	6	2.99	151	+ 1.0	- 1.5
Southern slope*.....	8	1.10	41	- 1.6	- 7.9
Southern Plateau*.....	10	1.61	159	+ 0.6	+ 0.6
Middle Plateau*.....	11	1.37	167	+ 0.5	+ 0.8
Northern Plateau*.....	11	1.33	143	+ 0.4	+ 0.3
North Pacific.....	7	1.09	44	- 1.4	- 3.4
Middle Pacific.....	7	0.67	118	+ 0.1	+ 6.8
South Pacific.....	4	0.02	9	- 0.2	+ 5.0

\*Regular Weather Bureau and selected cooperative stations.

#### Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	73	+ 2	Missouri Valley.....	70	+ 4
Middle Atlantic.....	83	+ 2	Northern slope.....	65	+ 10
South Atlantic.....	79	+ 1	Middle slope.....	64	+ 6
Florida Peninsula.....	80	+ 2	Southern slope.....	60	+ 3
East Gulf.....	77	+ 1	Southern Plateau.....	50	+ 11
West Gulf.....	65	+ 9	Middle Plateau.....	50	+ 12
Ohio Valley and Tennessee.....	73	+ 1	Northern Plateau.....	53	+ 1
Lower Lakes.....	74	+ 1	North Pacific.....	80	+ 8
Upper Lakes.....	70	+ 2	Middle Pacific.....	61	+ 6
North Dakota.....	74	+ 8	South Pacific.....	63	+ 3
Upper Mississippi Valley.....	78	+ 6			

#### Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Buffalo, N. Y.....	29	50	sw.	Pensacola, Fla.....	20	64	se.
Do.....	30	50	w.	Do.....	21	60	nw.
Duluth, Minn.....	20	54	sw.	Point Reyes Light, Cal.....	9	58	nw.
Eastport, Me.....	27	54	ne.	Do.....	20	68	nw.
Mount Tamalpais, Cal.....	19	51	nw.	Do.....	20	51	nw.
Do.....	23	62	sw.	Do.....	20	56	nw.
Nashville, Tenn.....	21	60	se.	Do.....	21	50	n.
New Orleans, La.....	20	66	se.	Tatoosh Island, Wash.....	23	52	c.
North Head, Wash.....	23	60	s.	Toledo, Ohio.....	22	50	s.
Do.....	28	64	se.				

## RAINFALL IN JAMAICA.

Through the kindness of Mr. Maxwell Hall, meteorologist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following data:

*Comparative table of rainfall.*  
[Based upon the average stations only.]  
SEPTEMBER, 1909.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1909.	Average.
			<i>Inches.</i>	<i>Inches.</i>
Northeastern division.....	25	17	15.18	7.80
Northern division.....	22	41	12.70	5.37
West-central division.....	26	20	19.45	10.34
Southern division.....	27	26	16.50	6.33
Means.....	100		15.66	7.44

The rainfall for the island for the month of September was

therefore more than twice the average. This heavy rainfall was due to two barometric depressions; the first continued from the 13th to the 15th, inclusive, and moving from the west of Jamaica onwards, it swept the Cayman Islands, the north-west of Cuba, and devastated New Orleans. The second continued from the 22d to the 27th, and again moved from the west of Jamaica.

These rains were highly beneficial to Jamaica.

The heaviest rainfall, 36.34 inches, occurred at Point Hill in St. Catherine; the smallest, 4.81 inches, occurred at Buff Bay.

Grand Cayman, August, 1909.	Total fall.	Greatest fall.		Number of days on which 0.01 inch fell.
		Amount.	Date.	
East End.....	14.96	12.32	24	10
Bodden Town.....	7.05	6.25	24	4
Georgetown.....	13.11	6.00	24	15

## RIVERS AND FLOODS.

The principal floods of the month occurred in the Rio Grande and in its tributaries in northern New Mexico. The heavy rains of August had left the ground in a more or less saturated condition, and during the first six days of September rains were frequent and at times heavy. Over the Zuni Mountain country of New Mexico there were heavy downpours on August 29 and 30, and on September 1, 4, and 5. The result was a vast volume of flood waters that rushed down the mountain sides, filling all the arroyos and canyons, and causing a great amount of damage. The dam of the Bluewater Development Company in Valencia County, N. Mex., was partially carried away, and the spillway of the Zuni Dam at Blackrock, McKinley County, was undermined for some distance. The officials at the dams were able to telephone notice of the disasters to places below, and no lives were lost. Estimates as to the amount of damage vary considerably. The railroads were the principal sufferers, as about 10,000 feet of track were washed away, and the roadbeds for several miles on either side softened. There was very little loss of livestock and crops, as the worst of the flood waters ran over raw and uncultivated lands.

The flood wave passed down the Rio Grande, the crest

reaching San Marcial, N. Mex., on September 7, with a stage of 14 feet, 3 feet above the flood stage, and El Paso, Tex., on September 10, with a stage of 14.5 feet, 0.5 foot above the flood stage. The river at El Paso was at flood stage from September 9 to 13, inclusive.

Warnings were sent to El Paso on September 7, and repeated southward to the mouth of the river. Newspaper reports indicate that considerable damage was done along the lower river, mainly, however, by flood waters from the Mexican tributaries.

The usual seasonal low-water stages prevailed in the great rivers, but they were considerably higher than during the corresponding period of the preceding year, and, as a rule, they were ample for the purposes of navigation.

Hydrographs for typical points on several principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport on the Red.—H. C. Frankenfeld, *Professor of Meteorology.*

## SPECIAL PAPERS ON GENERAL METEOROLOGY.

## RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

C. FITZBUGH TALMAN, Librarian.

The following have been selected from among the titles of books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be lent for a limited time to officials and employees who make application for them. Anonymous publications are indicated by a —.

**Austria.** K. und k. Kriegsmarine.

... Jahrbuch der meteorologischen, erdmagnetischen und seismischen Beobachtungen. N. F. 13. Band. 1908. Pola. 1909. xxxv, 152 p. f°. (Veröffentlichungen des Hydrographischen Amtes der K. und k. Kriegsmarine in Pola. Gruppe 2.)

**Beauchamp, R. de.**

Essai de défense contre la grêle. Poitiers. 1908. 22 p. 8°.

**Brodersen, Hans.**

Berichte über Blitzschläge der Jahre 1884 bis 1899. Kiel. 1909. p. 51-275. 8°. (Hrsg. vom Naturwissenschaftlichen Verein für Schleswig-Holstein als Fortsetzung von: L. Weber, Berichte über Blitzschläge in der Provinz Schleswig-Holstein. 1.-4. Folge. Kiel 1885.)

**Bunkofer, Wilhelm.**

Entwurf eines Apparates für Beobachtung der Luftdruckschwankungen mit sehr starker Vergrößerung. Wertheim a. M. 1908. 7 p. 8°. (Wissenschaftliche Beilage zum Jahresbericht des Grossherzoglichen Gymnasiums zu Wertheim für das Schuljahr 1907-1908.)

**Burgerstein, Alfred.**

Die Transpiration der Pflanzen. Jena. 1904. x, 283 p. 8°.

**Carrère, Jean.**

La terre tremblante. Calabre et Messine 1907-1908-1909. Paris. 1909. 341 p. 12°.

**Ficker, H. von.**

Klimatographie von Tirol und Vorarlberg. Wien. 1909. 162 p. 4°. (Klimatographie von Oesterreich. Heft 4. Hrsg. von... der K. k. Zentralstation für Meteorologie und Geodynamik.)

**Gellens, H. and others.**

La marée-tempête du 12 mars 1906 dans le bassin de l'Escaut maritime. Bruxelles. 1908. 62 p. 18 pl. 8°. (Extrait du 1 fascicule des Annales des travaux publics de Belgique, février 1908.)

**Genoa. R. Istituto idrografico.**

Riepilogo annuale delle osservazioni meteorologiche 1908. Genova. 1909. 17 p. f°.

**Gräter, A. S.**

Das neue Weltbild nach dem Niedergang der mechanischen Natur-